Nov. 18, 1930. J. H. WALLACE 1,781,712

WOOD PULP MATERIAL

Filed Feb. 5, 1925

Fig. 2

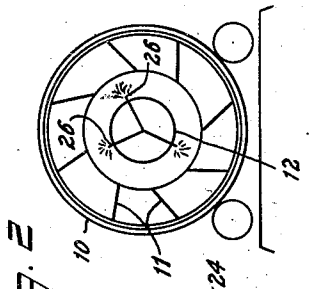
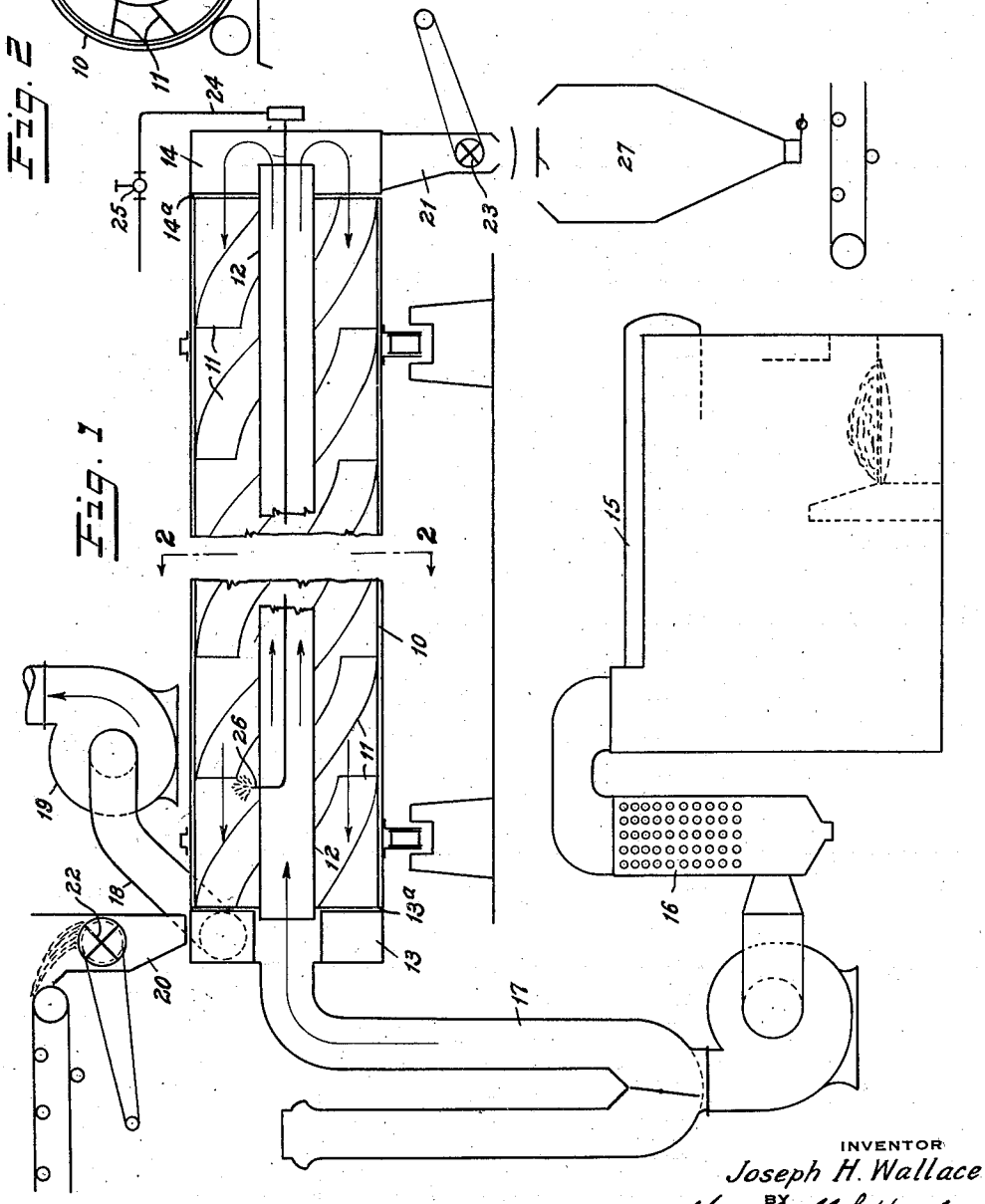


Fig. 1



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Patented Nov. 18, 1930 1,781,712

UNITED STATES PATENT OFFICE

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WOOD-PULP MATERIAL

Application filed February 5, 1925. Serial No. 6,958.

This invention relates to the material used for the manufacture of paper pulp, and has for its object the provision of a material which may be digested uniformly and efficiently.

The manufacture of paper pulp from wood by chemical processes involves what may be called a fractional or selective attack upon the wood components; the object being to produce a disintegration or solution of certain relatively less resistant components while leaving unattacked or unacted on certain relatively resistant components or "cellulose". The yield and quality of product depend largely upon the care with which the operation is performed; upon the observance of conditions which have been empirically established by long practice. The greater the exactitude with which these conditions can be observed, the better the results; but, for various reasons, the ordinary practice is not standardized to the degree which is desirable. It is an object of the present invention to promote accuracy and uniformity of operation by the provision of a standardized raw material; thereby facilitating standardization of the whole operation. With a standardized raw material there is no difficulty in using solutions of exact and standard composition; or of employing exact temperatures and an exact time of digestion.

The moisture content of wood, even from trees of one kind, varies greatly, from 20% or less in air dried or seasoned wood, to as much as 60% of the total weight of the wood, and this may amount to as much as eight hundred gallons of water carried in one thousand cubic feet of chips. Moreover the uneven distribution of the saps and soluble gums in the wood interferes materially with the desired uniformity of digestion.

In the soda or sulfate processes, chipped wood in fragments long enough to give the desired length of fiber in the pulp, is heated in a digester with an alkaline liquid to disintegrate and dissolve the non-cellulose portions, or "lignin", so that they may be removed. A less concentrated solution is required for such chips as have a low moisture content and but a small amount of saps and soluble gums, than for those having a high moisture content and a large amount of such saps and soluble gums. Also the time required for "cooking" (so called) varies with the moisture, sap and gum content of the chips. In former practice a high degree of skill is required to obtain the required liquor strength and to determine the proper length of time for cooking. Some of the chips become entirely digested before others are materially affected or some portions of an individual chip become digested before the rest of it. Speed of digestion is proportional to the strength of the alkaline liquid in contact with the fiber, and where a wet spot occurs or where there is an excess of sap or of soluble gums, the digesting liquid does not soak in readily and for a time is diluted. This time is that required for the equalization of the alkali content by diffusion, which is relatively slow. This results in a large percentage of screenings or rejects, which are a loss.

In my Patent No. 1,560,448, issued November 3, 1925, I have pointed out the desirability of having the moisture content of the wood chips as well as their resinous content uniform, and have shown that when it is uniform and known, the alkaline liquor may be always of the same strength, and that the time required for treatment will be a predetermined known element. In the aforesaid application, the process described was that applied to coniferous woods, and the moisture content was made uniform by evenly distributing the resinous content thereof, or in partially extracting the resinous content and evenly distributing the remainder. I have found, however, that the uniformity of moisture content and the even distribution of saps and soluble gums is of the utmost importance in pulping all kinds of woods, even those containing no resin. Consequently this application in which is disclosed a method of equalizing the moisture content and of evenly distributing the saps and soluble gums of pulp mill chips, regardless of whether or not they have any resin content, is a continuation in part of the aforesaid application.

Fig. 1 of the drawing is a more or less diagrammatic representation in longitudinal section of a drier mechanism of well known construction.

Fig. 2 is a transverse section taken on the line 2—2 of Fig. 1.

10 is a cylindrical shell of desired length, which may be covered with suitable heat insulation, so supported that it may be rotated about its axis. From the inner surface of this cylinder, a plurality of blades 11 project, which are so disposed as to lift and agitate the chips as they pass through the drier. These blades may be spirally disposed so as to assist in moving the chips through the drier longitudinally.

Within this rotary cylinder and extending through the center thereof is a pipe or flue 12 which serves to conduct heated air or waste gases into the drier and which provides a hot surface over which the contents of the drier fall as the outer cylinder rotates. The ends 13 and 14 of this application are stationary and suitable seals 13A and 14A are provided between them and the cylinder 10.

The source of heat, as shown for illustrative purposes, is from the waste gases of a steam boiler 15, which after they have passed over a fuel economizer 16 are led by a flue 17 to the flue 12. They emerge into the end 14 of the drier and pass back through cylinder 10 into the end 13 from which they are led by a flue 18. A fan or blower 19 is shown to assist the flow of the gases, the direction of movement of which is indicated by arrows.

Properly sized chips are introduced into the end 13 through a chute 20 and after passing through the drier they emerge through a chute 21 into a receiving bin 27. Baffle wheels 22 and 23 are shown in the chutes 20 and 21 respectively.

24 designates a steam pipe, controlled by a valve 25. This pipe leads through the flue 12 and terminates in nozzles 26 in the space between the flue 12 and the cylinder 10.

If desired, the chips may be subjected to saturated steam before they are carried to the drier. In fact such treatment alone would come within the scope of this invention, as it would reduce the moisture content of the more heavily loaded chips, especially such, if there be any, in which the moisture is frozen, and would increase the moisture content of the driest chips and thereby equalize to a substantial degree, the moisture content of the chips as a whole. This also results in the desired diffusion of the saps and soluble gums. Preliminary steam treatment furthermore, raises the temperature of the chips and thereby puts them in better condition for cooking, as will be shown later.

The chips enter the drier at the end thereof where the hot gases are moisture laden and the effect of the hot damp gases upon the driest of the chips is to increase their moisture content. Those of the chips which are heavily laden with moisture give it up and thereby an exchange of moisture content is effected, and a further diffusion of the saps and soluble gums obtained. In the cold season in northern climates, the moisture content of the chips is generally frozen. Naturally, the release of moisture from frozen chips which contain an excess of moisture is especially great when they are exposed to heat. Saturated steam may be admitted through the nozzles 26 if desired, to insure definite relative humidity conditions in the atmosphere within the drier.

As the chips travel through the drier, more and more of their moisture content is removed and they are delivered into the bin 27 with their moisture content substantially uniform, their average moisture content reduced, and with their saps and soluble gums diffused. The degree of reduction can be carried to any desired extent by choosing the rate of movement of the chips through the drier, the temperature of the hot gases and the length of the drier. If still greater reduction of moisture content is desired, the chips may be carried through one or more additional driers. This, however, is not necessary, as the even distribution and uniformity of the moisture content in the mass of chips is of greater importance than is the degree thereof. Moreover, if the chips are not to be digested immediately after their conditioning, it is desirable to leave in them enough moisture to make them non-hygroscopic so that their distributed moisture content is stabilized.

As heat is the medium by which the chips are conditioned in this invention, and preferably waste heat from boiler, incinerator, or other waste heat sources, a steam saving can be affected in favorable locations, where the conditioned chips can be run directly into the digester hot, or where they may be stored in bulk in heated condition to await the next digester charge. This is a material gain as the pulp manufacturer sustains a loss in using wood of high moisture content by reason of the amount of steam required to raise the moisture content to the temperature of digestion, and this is especially great when the moisture content is frozen, as it is invariably in the northern climates in the winter time. The additional heat thus required may amount to as much as one hundred pounds of coal per ton of pulp, which in many mills is a burden amounting to 6% of the fuel requirements for the entire pulp making process.

The chips treated in accordance with this

invention are in condition quickly to absorb into their cells the cooking liquors, the concentration of which can be predetermined accurately. The time required for cooking is no longer empirical, and the difficulty of overcooking and destroying some of the chips before some of them or parts of some of them are sufficiently digested to be useful, is obviated. Thus a greater amount of pulp is obtained from a given amount of material, its quality is improved and uniform and satisfactory results may be relied upon.

What I claim is:

1. The herein described method of making pulp which comprises removing excess moisture from a mass of wood chips by treating the mass with steam in the presence of heated gases and then at once transferring said mass to a digester.

2. The herein described method of making pulp which comprises reducing and unifying the moisture content of a mass of wood chips by treating the mass with steam in the presence of heated gases and then at once transferring said mass to a digester.

3. The hereindescribed method of preparing wood chips for pulp making, which comprises treating a mass of chips of unlike moisture content with steam in the presence of heated gases to reduce and unify their moisture content.

4. The hereindescribed method of preparing wood chips for pulp making which comprises diffusing the saps and soluble gums with steam in the presence of heated gases.

5. The hereindescribed method of preparing wood chips for pulp making, which comprises diffusing the saps and soluble gums with steam in the presence of heated gases and simultaneously reducing and unifying the moisture content in said mass.

6. The hereindescribed method of preparing wood chips for pulp making, which comprises diffusing the saps and soluble gums with steam in the presence of heated gases and simultaneously reducing and unifying the moisture content in said mass, and then introducing said mass into a suitable digesting liquor while it retains heat.

In witness whereof, I have hereunto set my hand this 2nd day of February, 1925.

JOSEPH H. WALLACE.